

Monitoring residual herbage in Wind Cave NP 2010-2013 using modified Robel pole calibrated for the southern Black Hills



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Wind Cave National Park (WICA) encompasses 33,851 acres in the southern Black Hills of South Dakota. The park is a mosaic of ponderosa pine forest and mixed-grass prairie, with approximately 60% covered with mixed-grass prairie.

Park purpose – protect the unique resources of Wind Cave and preserve and enhance mixed-grass prairie and native wildlife, while providing for the enjoyment of the public (WICA Foundation Statement 2011).

Forage resources in WICA are allocated as follows (2006 WICA Bison Management Plan):

- 25% for large mammal (bison and elk) forage;
- 25% for other wildlife habitat and to compensate for damage to plants (e.g. trampling, hail, etc.);
- 50% retained to ensure plant health and vigor.

Estimates of WICA forage production:

2004 - Forage-based management strategy for WICA wildlife/vegetation based on forage calculations using a weighted moving-mean for growth year precipitation.

2010 - Another model to predict WICA forage production (Keller and Millspaugh 2010) based on variables including spring precipitation, previous year spring precipitation, last date of spring frost, range/woodland site, canopy cover, and elevation.

Forage allocation models are not able to provide scientific data on real-time impacts of stressors (e.g. high animal populations, low precipitation) to actual WICA vegetation resources – needed to trigger actions to protect long-term plant health.

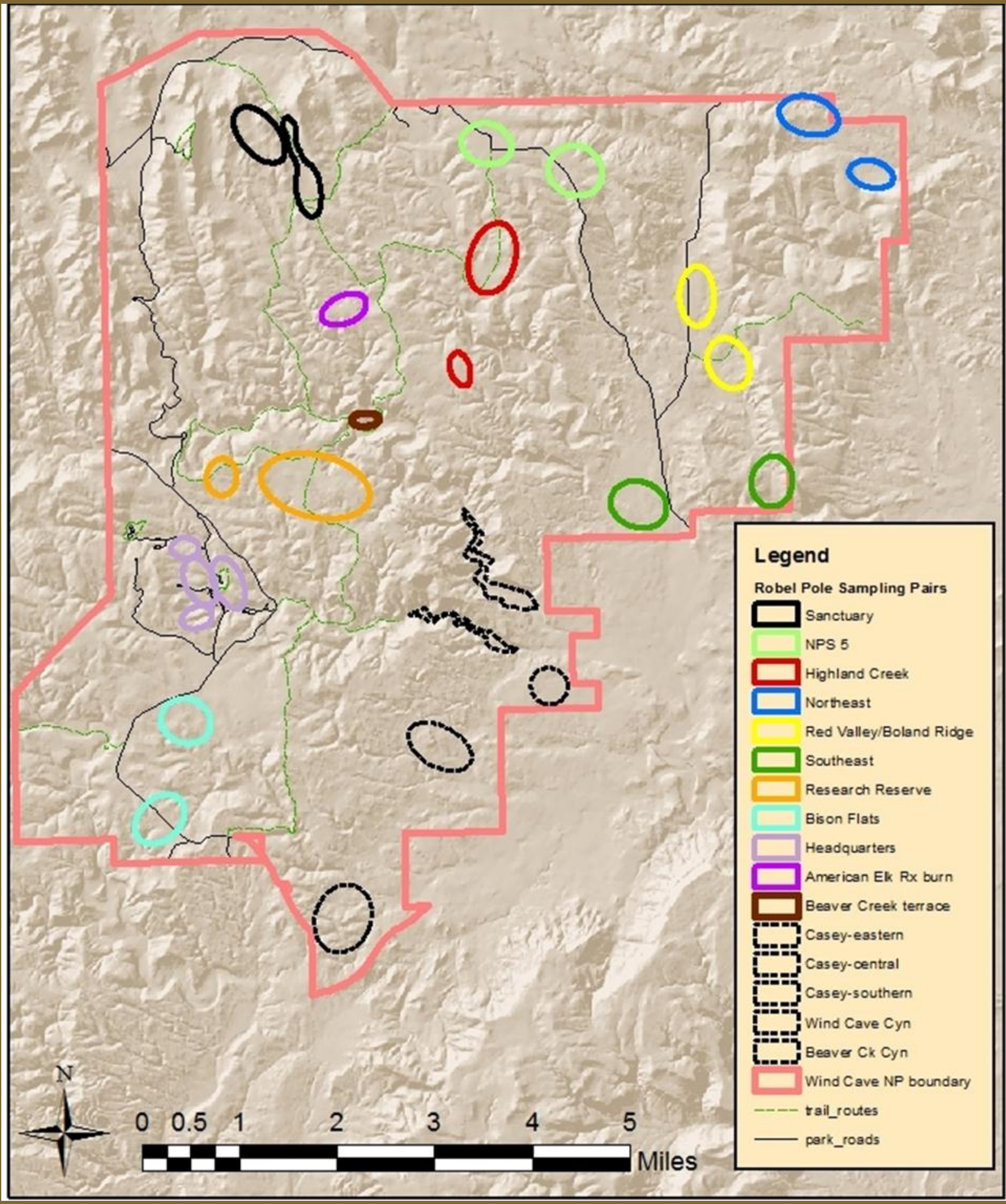
Benefits of modified Robel pole protocol for measuring residual herbage:

- Direct measurement of forage utilization is difficult – clipping methods are time-consuming, expensive and difficult to achieve with adequate replication.
- Indirect methods, such as ocular estimates method, are subject to inaccuracy and observer bias.
- Robel pole protocol has been proven to be a simple, fast, precise, and economical tool to monitor standing vegetation.

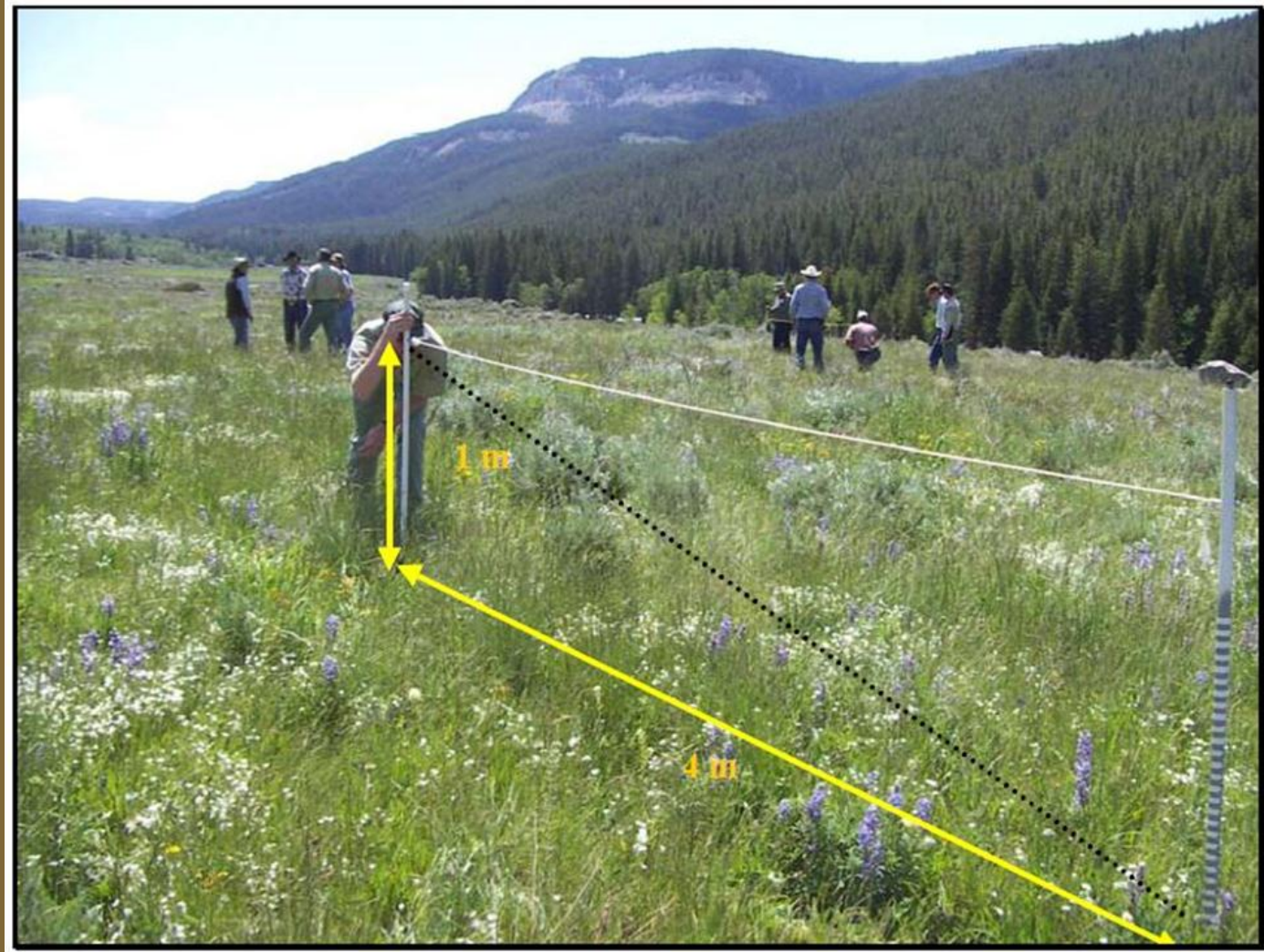
The WICA residual herbage monitoring project used the modified Robel pole calibrated for the southern Black Hills (Uresk et al. 2009) to collect real-time baseline data on residual herbage and make conclusions on vegetation conditions from 2010 through 2013.

Methods

- Robel readings collected in WICA 2010 – 2013 from mid-July through early October in 8 paired sample areas (mixedgrass prairie and mixed-grass prairie with prairie dogs). Four transects (200 m each) per sample area. Readings at 20 stations spaced 10 m apart (4 readings at each pole station).
- Used modified Robel pole with 1.27 cm (0.5-inch) alternating white and black bands. Readings made from a distance of 4 m at a height of 1 m. Number of the lowest visible band recorded.
- Pole station averages used to determine transect band average. Data from four transects averaged to provide grand average for each sample area. Grand average used to calculate herbage left ungrazed (kg/hectare and lbs/acre) using formulas developed for the southern Black Hills (Uresk et al. 2009).

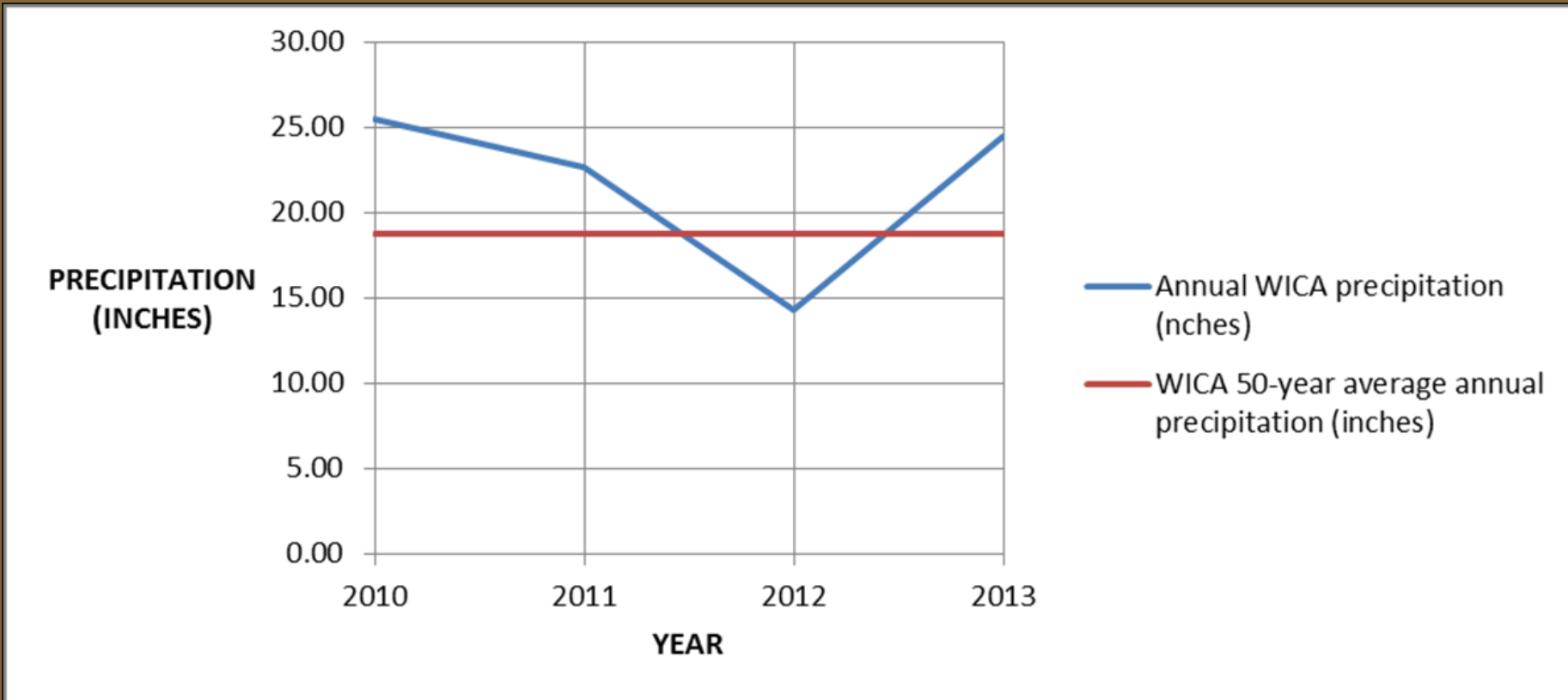


Above: Robel sample areas in WICA. Paired areas are same color polygons. Below: Demonstrating Robel data collection in the Bighorn Mountains (Photo by Dan Uresk and enhancements by Jody Javersak)



Results and Conclusions

Indicator of Condition	WICA Robel project analysis	Year	Ave Robel band	Standard for Assessment	Condition Status/Change
Residual herbage	Residual herbage in mixed-grass prairie	2010	11.01	Robel band 3 corresponds to residual herbage that is 60% of potential yield and minimum to support long-term plant health and rangeland ecological health in southern Black Hills (Uresk et al. 2009).	
		2011	15.31		
		2012	6.04		
		2013	8.35		
	Residual herbage in mixed-grass prairie with prairie dogs	2010	4.23	Robel band 5 is recommended visual obstruction reading to maintain prairie dogs with limited or no expansion (Uresk and Mergen 2012).	Potential for expansion
		2011	4.62		
		2012	1.40		
		2013	3.16		



Summary of WICA annual precipitation 2010-2013

- Mixed-grass areas without prairie dogs but grazed by bison and other wildlife were above the target level of band 3 (from Uresk et al. 2009) in every year from 2010 – 2013, indicating at least 60% residual herbage which is protective of long-term plant and rangeland health.
- From 2010 through 2013, areas of mixed-grass prairie were primarily above the target level of band 5 and areas of mixed-grass prairie with prairie dogs were primarily below the target level of band 5 (from Uresk and Mergen 2012) indicating vegetation height/density conditions maintaining prairie dogs with limited or no expansion. Other monitoring in WICA between 2010 and 2013 documented decreasing prairie dog acres. More investigation is needed to understand interactions of vegetation height/density with other factors (such as white horehound (*Marrubium vulgare*) infestations and black-footed ferret populations) relative to decreasing prairie dog acres.
- WICA residual herbage monitoring results combined with results from other WICA vegetation monitoring (Burkhart and Kovacs 2013) suggest that water rather than vegetation is a limiting factor for WICA ecological health.

References:

- Burkhart B.A. and K.L. Kovacs. 2013. Condition assessment of streambanks and streamside vegetation on perennial streams in Wind Cave National Park: 2009-2012. Natural Resource Technical Report. NPS/WICA/NRTR-2013/758. National Park Service, Fort Collins, Colorado.
- Uresk, D.W., D.E. Mergen, and T.A. Benzou. 2009. Estimating standing vegetation with a modified Robel pole on meadows and grasslands in the southern Black Hills of South Dakota. Proceedings of the South Dakota Academy of Science. Vol. 8 (2009).
- Uresk, D. W. and D.E. Mergen 2012. Monitoring mid-grass prairie in southwestern South Dakota and northwestern Nebraska, USA. Japanese Society of Grassland Science ISSN1744-6961.

